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I also certify that the application is now proceeding in the name as identified herein.

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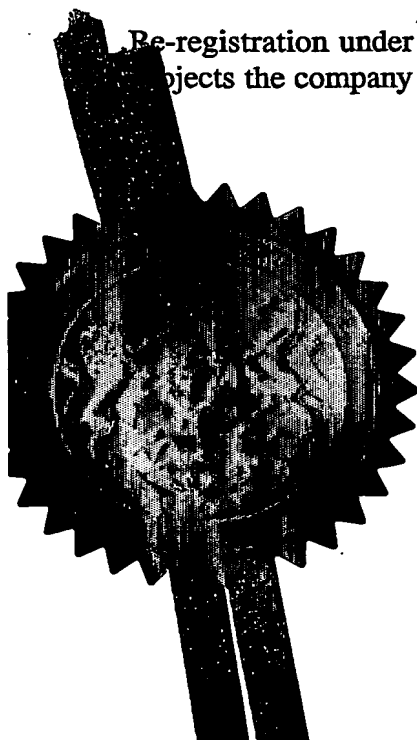
Signed

Dated   4 October 2004

GB 0315492.9

By virtue of a direction given under Section 30 of the Patents Act 1977, the application is proceeding in the name of:

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Incorporated in the United Kingdom,

[ADP No. 08843435001]

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Your reference **App Kill (UK)**	

The **Patent Office**

Request for grant of a Patent

Form 1/77   Patents Act 1977

1   Title of Invention

A method of enabling a multitasking wireless Information device to conserve battery power

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2.   Applicant's details   0 2 JUL 2003   **0315492.9**

[X]   First or only applicant

2a   If applying as a corporate body: Corporate Name

Symbian Limited

~~SECTION 30(1977 ACT) APPLICATION FILED~~ 2/7/04 ✓

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Forenames

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3 Address for service

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Agent's ADP Number	C03274

_0727045700 2_

4 Reference Number

App Kill (UK)

5 Claiming an earlier application date

An earlier filing date is claimed:

Yes ☐   No ☒

Number of earlier
application or patent number

Filing date

15 (4) (Divisional)	6(3)	12(6)	37(4)
☐	☐	☐	☐

6 Declaration of priority

Country of filing	Priority Application Number	Filing Date

7 Inventorship

The applicant(s) are the sole inventors/joint inventors

Yes ☐   No ☒

8 Checklist

			Continuation sheets	
Claims	1		Description	5
Abstract	0		Drawings	0

Priority Documents   Yes/No

Translations of Priority Documents   Yes/No

Patents Form 7/77   Yes/No

Patents Form 9/77   Yes/No

Patents Form 10/77   Yes/No

9 Request

We request the grant of a patent on the basis
of this application

Signed: *Origin Limited*   Date: 2 July 2003

(Origin Limited)

A METHOD OF ENABLING A MULTITASKING WIRELESS INFORMATION DEVICE TO CONSERVE BATTERY POWER

5 **BACKGROUND OF THE INVENTION**

1.   Field of the Invention

This invention relates to a method of enabling a multitasking wireless information device
10 to preserve battery power.   The term 'wireless information device' used in this patent
specification should be expansively construed to cover any kind of device with one or
two way wireless information capabilities and includes without limitation radio
telephones, smart phones, communicators, personal computers, computers and
application specific devices. It includes devices able to communicate in any manner over
15 any kind of network, such as GSM or UMTS, CDMA and WCDMA mobile radio,
Bluetooth, IrDA etc.

2.   Description of the Prior Art

20 Battery conservation in wireless information devices is very important, particularly in
devices such as smartphones that consume high power levels by virtue of connecting to
always-on GPRS or 3G cellular networks.

In conventional multi-tasking computers running several different applications at the
25 same time, an application will issue a software interrupt to the operating system when it
first requests services; interrupts from different applications are prioritised and queued by
an interrupt handler. A scheduler starts and ends applications and manages concurrently
running applications.

30 Conventionally, the scheduler will end an application when instructed to do so by the
end user, e.g. selecting a 'quit' option in the application's drop down menu.
Consequently, without an explicit 'quit' command, applications will continue to run even
when not actually in active use; they will therefore continue to use some system
resources, even when residing in the 'background'. An application is in the background

if it is not being interacted with by an end-user and it presents no user interface with which a user could interact (but it could for example present an icon indicating its presence and the fact that it was still active). A foreground application conversely does present a user interface with which a user can interact.

5

Hence, the problem of battery conservation is especially acute for multi-tasking devices, i.e. devices with an operating system that can run several applications at the same time.

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SUMMARY OF THE INVENTION

In the present invention, a multitasking wireless information device preserves battery power by determining if a non-trusted application is in the background or foreground

5   and preventing a non-trusted application that is in the background from running.

For desktop computers, the fact that applications can run in the background and hence still consume some system resources (CPU, power) is not that problematic. However, in the wireless information device domain, it is valuable to conserve power wherever

10 .   possible.   A device implementing the present invention denies system resources and services to background applications that do not meet predefined 'trust' or certification criteria – i.e. criteria which define the level of trustworthiness of the application. Trust will conventionally be established using a signature in the installation file, although there are other techniques that may be deployed as part of the secure computing base of the

15   device. Hence, third party applications (such as downloaded applications like games) will be prevented from running in the background. Trusted applications may still be allowed to run in the background, or they may be actively prevented in the same was as non-trusted applications, or they may be requested (but not prevented) to stop running if in background.

20

A window server component may be used to determine if an application is in the background or foreground; for applications in the background, it can send a control signal to the scheduler or interrupt handler that in effect prevents the application from running, e.g. being given any services or consuming any resources. The scheduler could

25   for example, simply operate so as to never allocate any services or resources to the background application; an alternative would be for the interrupt handler to simply place any interrupts from the background application to the back of its queue and never allow them to be executed.

30   On example use of the present invention is to prevent background applications from 'polling' for data over a wireless network, an activity that can potentially drain a battery quickly.   Another example is that applications will automatically be prevented from running if the display shows a screen saver or is actually turned off (unlike PCs, wireless

information devices can perform useful functions such as telephony even when the screen is turned off). Hence, the present invention is a valuable addition to power conservation strategies used in wireless information devices.

5   When the device determines that an application is in the foreground (again, as may be determined by a window server component), it allows that application to run again — e.g. to be provided with resources and services.

10

DETAILED DESCRIPTION

Symbian OS based phones are open for third party applications. The applications are often games or similar types of applications and when these execute the CPU is often
5   running at full speed to update graphics, sounds etc. When the user or the system should display another application or dialog, there is a risk that the third party application will still run in the background and thus draining the battery. Third party applications can either come from 'trusted' sources or 'untrusted' sources. This is determined by a signature in the installation file.

10

When an untrusted application is running and another application should be in the foreground, the untrusted application is prevented from running. When the application is brought to the foreground again, it continues to run. The scheme is ensured by a system component which both knows which processes and threads belong to trusted or
15   untrusted applications as well as knows which application is in foreground and which ones are in background. In Symbian OS this is most likely to be the window server component.   C++ and Java applications can be controlled in this way.

The applications could take notice of an event sent to them when the application is sent
20   to background but this is likely to be missed in applications which are not validated as proper implementations – i.e. untrusted applications. 'Untrusted' applications are more likely to contain a wrong implementation of normal background behaviour; hence, merely relying on an application to voluntarily cease running when notified that it is in the background is an inadequate strategy for no-trusted applications. Instead, they need
25   to be actively prevented from running.

If the applications prevented from executing in the background are locking many resources, such as files or communications ports, this is a potential for deadlocks but schemes can readily be designed for discovering them

30

CLAIMS

1.   A method of enabling a multitasking wireless information device to preserve battery power, comprising the steps of determining if a non-trusted application is in the background or foreground and preventing a non-trusted application that is in the background from running.

2.   The method of Claim 1 in which a window server component determines if an application is in the background or foreground.

3.   The method of Claim 2 in which, for applications in the background, the window server sends a control signal to a scheduler or interrupt handler to prevent the application from running.

4.   The method of Claim 1 which is used to prevent background applications from 'polling' for data over a wireless network.

5.   The method of Claim 1 which is used to prevent background applications from running if the display shows a screen saver or is turned off.

6.   The method of Claim 1 in which system resources and services are denied to a background application only if it does not meet predefined 'trust' or certification criteria established using a signature in an installation file for the application.

7.   A multitasking wireless information device programmed to be able to preserve battery power by being capable of determining if a non-trusted application is in the background or foreground and preventing a non-trusted application that is in the background from running.